THE PLATANUS LACE BUG, *CORYTHUCHA CILIATA* (SAY) (HEMIPTERA: TINGIDAE), A NEARCTIC PEST OF PLANE TREES, NEW TO BRITAIN

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Abstract

In September and October 2006, *Corythucha ciliata* (Say) was reported in Bedfordshire. This is the first record of this Nearctic tingid in Britain. It was causing feeding damage to imported London plane (*Platanus* × *hispanica*) and Oriental plane (*P. orientalis*) trees at two commercial plant nurseries, and to mature plane trees (*Platanus* sp.) growing in adjacent hedgerows. It has been introduced to several other European countries where it has become an important pest of plane trees. In northern Italy *C. ciliata* can cause decline and death of trees in combination with two fungi, *Ceratocystis fimbriata* Ellis & Halsted f.sp. *platani* Walter and *Apiognomonia veneta* (Sacc. & Speg.) Höhn.. The host range, biology, geographical distribution and economic importance of *C. ciliata* are reviewed.

Introduction

The Plant Health and Seeds Inspectorate (PHSI) of the Department of Environment, Food and Rural Affairs (Defra) inspected a commercial plant nursery, East of Bedford, Bedfordshire on the 28th September 2006. Inspectors collected leaf mine samples from Oriental plane *Platanus orientalis* L. (Platanaceae) trees imported from France and submitted them to the Central Science Laboratory (CSL) for diagnosis. The leaf mines were caused by the larvae of *Phyllonorycter platani* (Staudinger) (Lepidoptera: Gracillariidae), an introduced species that has become naturalised in southern England since 1989 (Emmet, 1991). Also present in the samples were fourth and fifth-instar lacebug nymphs, suspected to be *Corythucha ciliata* (Say) (Hemiptera: Tingidae). This was confirmed by rearing the nymphs to adulthood in quarantine at the Central Science Laboratory under licence (No. PHL 251C/5482/C09/2006), which took three days at 21.5°C. The Plant Health & Seeds Inspectorate reinspected the nursery on the 6th and 10th October 2006 and found large numbers of *C. ciliata* nymphs and adults causing chlorosis, in some cases severe, to the foliage of over one hundred *P. orientalis* and London plane (*Platanus* × *hispanica* Muenchh.) trees (up to 7 m tall) imported from France, and on mature plane (*Platanus* sp.) trees (up to 15 m tall) growing in a hedge approximately 50 metres from the nursery. A second commercial nursery was visited in Bedfordshire on the 11th October and *C. ciliata* nymphs and adults were found on *Platanus* spp. imported from Italy and on six-year-old *Platanus* trees grown at the nursery from cuttings. This is the first time that *C. ciliata* has been found in Britain. The presence of this new pest was publicised by Defra (Malumphy *et al.*, 2006) and by a special interest group (Malumphy & Reid, 2006). The purpose of this communication is to publish collection details for the first time and review the host range, biology, geographical distribution and economic importance of *C. ciliata.*

Corythucha ciliata is commonly known as the 'sycamore lace bug' in North America (Halbert & Meeker, 1998), where *P. orientalis* is known as American sycamore. However, the name sycamore lace bug could be confusing in Britain, as it does not feed on sycamore (*Acer pseudoplatanus* L.). 'Platanus lace bug' would be a

more accurate designation in the UK and be consistent with the common names used in Europe, for example in Austria and Germany, 'Die Platanen Netzwanze' (Billen, 1985; Hopoltseder, 1984; Hopp, 1984), France, 'Le tigre du platane' (D'Aguilar *et al.*, 1977; Anon., 1986), Italy, 'La tingide del platana' (Arzone, 1975) and Spain, 'tigre del platano' (Serra Planas, 1982).

Adult (Fig. 1) specimens of *C. ciliata* have been deposited at the Central Science Laboratory, the Natural History Museum, London (BMNH), the Huntarian Museum, Glasgow and National Museum Wales, Cardiff.

Detection and identification

Adults and nymphs of *C. ciliata* feed on the underside of leaves causing chlorosis and desiccation of tissue (Fig. 2), first near the veins, and subsequently affecting the entire leaf, which may drop prematurely (Maceljski & Balarin, 1973; Venturi, 1976; Chauvel, 1988). Heavy infestations cause conspicuous chlorosis, which is easily observed some distance away from the infested tree (PHSI, pers. comm., 2006). The tingids also produce droplets of liquid frass, which dry out as black spots on the lower surface of the leaves (Fig. 3); the leaves are also covered in nymphal skins, which have remained attached to the leaf after moulting (Chauvel, 1988).

The eggs are elyptical, brown, with a lighter operculum; 0.5 mm long by 0.2 mm wide; laid in groups of 3–8 in the angles of the main vein on the undersides of the leaf (Maceljski & Balarin, 1974; Hopoltseder, 1984). There are five nymphal stages (Horn *et al.*,1979). The nymphs (Fig. 4) are dorso-ventrally flattened, oval in shape, black and spiny. The adult bodies are almost black in colour but this is hidden beneath a grey/cream net or lace-like structure on the upper surface (Figs. 1 and 5). They attain a length of 4 mm; the females are slightly larger than the males.

Detailed morphological descriptions of the adult are given by Maceljski & Balarin (1972, 1974) and are illustrated by Maceljski & Balarin (1974), Tomic & Mihajlovic (1974), D'Aguilar *et al.* (1977), Hopoltseder (1984), Gessler & Mauri (1987) and Chauvel (1988). The fifth instar nymph is described and keyed out by Horn *et al.* (1979). Maceljski & Balarin (1974) describe all developmental stages.

For practical purposes, the association with *Platanus* should be diagnostic for this species in Britain as no other tingid species feed on this genus in Britain.

Geographical distribution

Corythucha ciliata is of North American origin and occurs in the eastern USA and southern Canada (Baker, 1972; Halbert & Meeker, 1998). It was accidentally introduced into Europe being first recorded in Padova, Italy in 1964 (Arzone, 1975). It has since spread throughout Italy (Battisti & Giulini, 1983; Marletto & Menardo, 1984; including Sicily, Hoffmann, 1978), and Austria (Hopoltseder, 1984; Zukrigl & Hobaus, 1989), Bulgaria (Josifov, 1990), Croatia (Maceljski & Balarin, 1972, 1973), France (D'Aguilar *et al.*, 1977; D'Aguilar, 1982; Duverger, 1983; Anon., 1986; Chauvel, 1988; Decoin, 2006), Germany (Hopp, 1984; Billen, 1985; Heckmann & Rieger, 2001; Hoffmann, 2003), Greece (Tzanakakis, 1988), Hungary (FAO, 1977; Saly & Ripka, 1989), Russia (Voigt, 2001; Gninenko & Orlinskii, 2004), Serbia (Tomic & Mihajlovic, 1974; Vasic, 1975), Slovenia (Maceljski & Balarin, 1972), Spain (Gil Sotres & Mansilla Vazquez, 1981) and Switzerland (Maceljski & Balarin,1972; Gessler & Mauri, 1987; Wyniger, 2003).

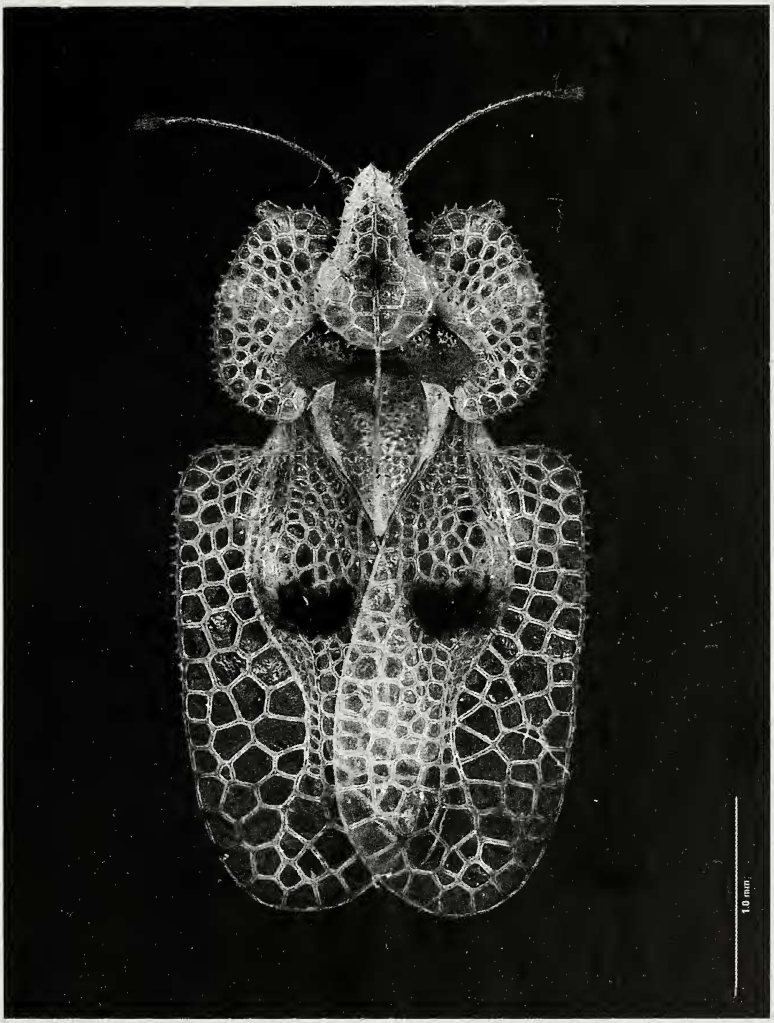

Fig. 1. *Corythucha ciliata* adult (Photo: James Turner of the National Museum Wales).

It has recently been introduced to Asia: China (Streito, 2006), Japan (Tokihiro *et al.*, 2003) and South Korea (Chung *et al.*, 1996;); and South America: Chile (Prado, 1990).

Host plants, biology and natural enemies

The preferred host of *C. ciliata* is reported to be *P. occidentalis* (Maceljski & Balarin, 1972, 1973; Rogers *et al.*, 1982; Halbert & Meeker, 1998) and in southern Europe it is also commonly found on *P.* × *hispanica* (= *P.* × *acerifolia* Willd.)

Fig. 2. *Corythucha ciliata* feeding damage to upper surface of leaf (CSL).

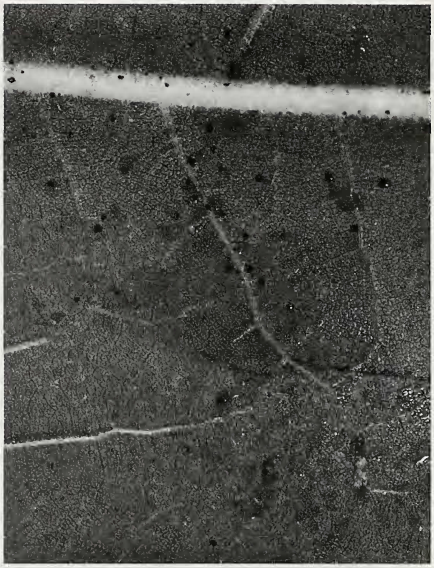

Fig. 3. *Corythucha ciliata* frass depositied on lower leaf surface (CSL).

Fig. 4. *Corythucha ciliata* nymph (CSL).

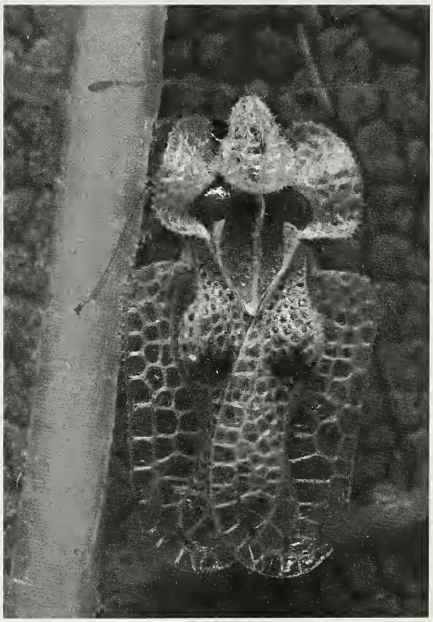

Fig. 5. *Corythucha ciliata* adult (CSL).

(Balarin, 1972, 1973; FAO, 1977; Maceljski & Rogers *et al.*, 1982; Hopoltseder, 1984; Battisti *et al.*, 1985). Other *Platanus* hosts include *P. orientalis* L. (Maceljski & Balarin, 1972; Battisti *et al.*, 1985), *P. racemosa* Nutt. (Rogers *et al.*, 1982) and *P. wrightii* S. Wats. (Rogers *et al.*, 1982).

Several other host plants are listed in the literature, including *Broussonetia papyrifera* (L.) L'Hér. ex Vent. (Moraceae) (Rogers *et al.*, 1982; Halbert & Meeker, 1998), *Carya ovata* (Mill.) K. Koch (Juglandaceae) (Baker, 1972; Rogers *et al.*, 1982; Halbert, & Meeker, 1998), *Chamaedaphne* sp. (Ericaceae) (Rogers *et al.*, 1982; Halbert & Meeker, 1998), *Fraxinus* sp. (Oleaceae) (Baker, 1972; Rogers *et al.*, 1982; Halbert & Meeker, 1998), *Morus* sp. (Moraceae) (Baker, 1972) and *Quercus laurifolia* Michx. (Fagaceae) (Baker, 1972).

The biology and ecology of *C. ciliata* has been studied in France (Chauvel, 1988), Korea (Park *et al.*, 1999), Hungary (Oszi *et al.*, 2006) and Italy (Venturi, 1976; Battisti *et al.*, 1985). *Corythucha ciliata* adults overwinter under loose bark, leaf litter and crevices, and tolerate extreme temperatures as low as −30°C (Chauvel, 1988). The exfoliation of the outer bark, especially in *P.* × *hispanica*, may be determinant in the successful use of Platanaceae by *C. ciliata*. Overwintering occurs, by preference and often in large dense aggregations, under exfoliated bark platelets *in situ* (Paul F. Whitehead, pers. comm., 2007). The adults congregate on the developing leaves in the following spring. The females deposit up to 350 eggs on the lower surface of the leaves, (D'Aguilar *et al.*, 1977), with an average of 100 eggs per female (Battisti *et al.*, 1985). Nymphs stay close together at first, only moving to new leaves after they reach the fourth instar. In the south of France it takes 43 to 56 days to complete the life cycle, and in Italy just 29 to 36 days (Chauvel, 1988); two or three generations can occur each year. In Italy, the eggs of the first generation are laid at the end of April or beginning of May, those of the second at the end of June or beginning of July, and the third in August-September (Venturi, 1976). The optimum temperature for egg and nymph development was estimated to be 25°C in Korea, and the longevities of adults were 41 days and 37 days for females and males, respectively (Park *et al.*, 1999).

Maceljski (1986) reported that the adults are good fliers, whereas Wade (1917) reported that the wings of the adults are very delicate, and they rarely fly very far; however, supported by wind they can be blown over many kilometres. Both authors suspect that human activity is the main cause of its spread over long distances.

Twenty-eight species of natural enemies of *C. ciliata* have been recorded in Italy (Travella & Arizone, 1987).

Economic importance

Infestations of *C. ciliata* on *Platanus* can cause severe chlorosis, partial defoliation, reduction in growth and thinning of fronds (Venturi, 1976; Chauvel, 1988), particularly in young trees (Maceljski, 1986). Damage is most noticeable on plane trees planted for ornamental purposes in parks and urban areas and increases through the year from July to September (Battisti *et al.*, 1985). Several consecutive years of severe lace bug damage, combined with other stress factors, may kill the trees. Damage is more severe during dry weather. In northern Italy, the lace bug in combination with two fungi, *Ceratocystis fimbriata* Ellis & Halsted f.sp. *platani* Walter (Ascomycetes: Ceratocystidaceae) and *Apiognomonia veneta* (Sacc. & Speg.) Höhn. (Ascomycetes: Valsaceae), can cause decline and death of trees (Anselmi *et al.*, 1994). The former fungus is a quarantine-listed pest in the EU and the latter is native to the UK. It is suspected that the lace bugs may serve as vectors for these fungi.

Although *C. ciliata* has been found feeding on other host genera in the USA, it has not been recorded damaging these plants.

Corythucha ciliata is also reported to be a major public nuisance as large numbers of *C. ciliata* land on people in parks and open-air cafes in southern Europe. They may also invade homes in large numbers (Maceljski, 1986) and have even occasionally been reported 'biting' humans (Venturi, 1976).

Conclusions

Corythucha ciliata has been introduced into the UK on imported plane trees from either or both of Italy and France. The presence of this pest in northern France (Decoin, 2006) suggests that it will be able to naturalise and spread in Britain. The extent of the infestations at the nurseries where the pest was first discovered and the presence of the pest on trees off the nursery premises indicates that is likely to have been present for more than one season and thus may have already been transported to new locations by trade.

The size of some of the trees being imported into the UK and the scale of the trade make it very difficult for the Plant Health & Seeds Inspectorate to conduct effective inspections of these plants. Not all trees, which are moved between EU member states with a plant passport, such as *Platanus* sp., are inspected by the PHSI and the current inspection regime is probably inadequate to prevent further introductions. The import of large trees from southern Europe is likely to continue to provide a pathway for the introduction of other non-native plant pests into Britain. For example, the American oak lace bug, *Corythucha arcuata* (Say), was introduced into Italy in 2000 and spread to Switzerland in 2001/2002 (Forster *et al.*, 2005) and is likely to spread within Europe both naturally and over large distances by trade. This oak pest is on the European and Mediterranean Plant Protection Organisation (EPPO) alert list.

Any suspected findings of non-indigenous insects on recently imported plants should be passed to the local Defra PHSI or to the Plant Health & Seeds Inspectorate Headquarters, York (Tel.: 01904 455174, email: planthealth.info@defra.gsi.gov.uk).

Acknowledgements

The authors would like to thank Helen Long and Richard Venelle of the Plant Health & Seeds Inspectorate for collecting samples and providing information; Dr Mike Wilson and Richard Turner of the National Museum Wales for supplying a photograph of *C. ciliata*; and Paul F. Whitehead for providing valuable comments on the manuscript and sharing his observations on *C. ciliata*. The Plant Health Division of Defra funded this work.

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